

REMARKS

INTRODUCTION

In accordance with the foregoing, claims 1, 3, 32 and 34-38 been amended. Claims 2, 33 and 39 have been cancelled. Claims 1, 3-32 and 34-38 are pending and under consideration.

CLAIM REJECTIONS – 35 USC 103

Claims 1-39 were rejected under 35 USC 103(a) as being unpatentable over Kuroki et al. (US 6,898,485) (hereinafter “Kuroki”).

Kuroki discusses a device and method for controlling operation of a legged robot and a robot device. In the robot discussed in Kuroki, each leg constituting the lower limbs has a hip-joint yaw-axis 16, a hip-joint pitch-axis 17, a hip-joint roll-axis 18, a knee-joint pitch-axis 19, an ankle-joint pitch-axis 20, an ankle-joint roll-axis 21, and a foot 22. The cross point between the hip-joint pitch-axis 17 and the hip-joint roll-axis 18 defines a hip-point location of the legged walking robot 100. Although the human foot 22 actually has a structure including a bottom having multi-joints multi-degrees-of-freedom, the foot bottom of the legged walking robot 100 has zero degree of freedom. Each leg has 6 degrees of freedom. Kuroki, 11:60-12:5.

Claims 1-31

Amended claim 1 recites: “...wherein each of the ankle joints comprise: a first yoke incorporated with an upper part of the foot member; and a second yoke incorporated with a lower part of the calf member and coupled to the first yoke by a trunnion so as to rotate the foot member relative to the calf member.” Support for this amendment may be found in at least original claim 2 and paragraph [0038] of the specification. In contrast to amended claim 1, Kuroki does not discuss the structure of the ankle joint nor discuss first and second yokes or a trunnion connecting the two yokes.

Claim 1 further recites: “...a pair of first actuators coupled to both of each of the respective foot member and the calf member to rotate the foot member relative to the calf member about the ankle joint in the forward, backward, right, and left directions...” In contrast to claim 1, Kuroki provides a single actuator for rotation of each joint. Claim 1 recites a pair of actuators connected in a parallel structure for rotation of ankle and hip joint in the forward,

backward, right and left directions. Therefore, it is possible to control each joint more easily and with less driving power.

Claims 3-31 depend from claim 1 and are believed to be allowable for at least the foregoing reasons. Further, claims 3-31 recite features that patentably distinguish over Kuroki. For example, claim 9 recites a hinge part on which the third link and the second actuator are pivoted is positioned above the knee joint, so that the calf member is rotated backward relative to the femoral member beyond a right angle. As such, wider rotation of the knee joint is possible than is discussed in the cited references. Claim 2 has been cancelled.

Withdrawal of the foregoing rejections is respectfully requested.

Claims 32-38

Amended claim 32 recites: “...each of the first, second, third, and fourth actuators comprise: a motor; a ball screw to be rotated by the motor; a guide rod provided in a part of each of the actuators to engage with the ball screw to be linearly guided by a guide member; a moving block to attach to an end part of the guide rod; and a position sensor connected to the guide rod to sense a position of the moving block which moves together with the guide rod.” Support for this amendment may be found in at least original claim 33. In contrast to claim 32, Kuroki does not discuss an actuator having a guide rod provided in a part of each of the actuators to engage with a ball screw to be linearly guided by a guide member. In Kuroki, the structure of the actuator is not discussed. Instead, Kuroki incorporates an AC servo actuator disclosed in Japanese Unexamined Patent Application No JP-2002-299970 (hereinafter “Shinji”). In Shinji, an AC servo motor is composed of a motor part 2 and a torque amplification part 3, and accommodates a rotor shaft magnetic pole angle sensor 22 for detecting the magnetic pole angle of a rotor shaft 6, a control substrate 23 for controlling the output shaft 6, and a power substrate 24 for supplying a drive current to each coil 11 of the motor part 2. Neither Shinji nor Kuroki discusses an actuator having a guide rod provided in a part of each of the actuators to engage with a ball screw to be linearly guided by a guide member.

Amended claims 34-38 depend from claim 32 and are believed to be allowable for at least the foregoing reasons. Claims 34-38 have been amended to improve the form of the claim. Further, claims 34-38 recite features that patentably distinguish over Kuroki. For example, claim 38 recites that when the moving block of a left third actuator of the third actuators

moves downward and the moving block of a right third actuator of the third actuators moves upward, the femoral member rotates rightward relative to the hip member. Claim 33 has been cancelled.

Withdrawal of the foregoing rejections is respectfully requested.

Claim 39

Claim 39 has been cancelled.

CONCLUSION

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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